

SET DEFENCE MEANS BACKGROUND OF THE INVENTION

Field of the Invention

This invention relates to defence means. In particular this invention relates to
5 set defence means for defending a designated area.

Discussion of the Background Art

Conventional set defence means for defending a designated area is by
placement of concealed land mines throughout the designated area. These land
10 mines are normally placed randomly throughout the designated area.

This form of set defence has been widely used in the past and unfortunately it
has resulted in many past war zones remaining mined long after peace has returned
to the zone. This often renders good fertile land unusable and causes widespread
injury to innocent civilians.

15 Furthermore areas which are mined are not normally mined with a view to
preventing all personnel passing beyond the mined zone. Typically areas are mined
so that the likelihood of personnel being injured is high. This acts as an effective
deterrent to ingress upon the mined zone. To this end, the mines are arranged
randomly and not on any fixed grid spacing as any fixed arrangement would enable
20 relatively simple clearing of a mined site.

Typically persons who may be considered as dispensable in a war situation
may be induced to pass through the mined area to establish a safe path for the
following army. Likewise, mines may be cleared from a relatively narrow path
through the mine zone in order to render the mining ineffective for preventing an
25 enemy breaching the mined zone.

Unfortunately the random placement of the mines make them difficult if not
impossible to recover at a later date.

SUMMARY OF THE INVENTION

30 Object of the Invention

This invention aims to provide set defence means which will alleviate at least one of
the abovementioned disadvantages.

Disclosure of the Invention

With the foregoing in view, this invention in one aspect resides broadly in set defence means for defending a designated area including:-

at least one monitor for monitoring the designated area to detect any zone
5 therein in which a new presence appears;

defence including multi-barrel weapons each having barrels loaded with multiple sequentially fired projectiles selectively fired by electronic controls and capable of debilitating personnel or vehicles present anywhere in a remote designated area; and

10 communication means providing communication between the monitor and the defence for triggering selective activation of the defence for delivering a debilitating attack to the detected zone.

The monitors include one or more on-site sensors deployed in the designated area or remote sensing means deployed remote from the designated area.
15 Alternatively the monitoring means may include both on-site and remote sensing means.

The monitoring means may also provide a visual display of the monitored designated zone so that manual override means may be actuated, if desired, to enable manual control of the set defence means.

20 Preferably the defence is adapted for inconspicuous placement, however in some applications conspicuous defence may be utilised as a deterrent. The defence may be any suitable arrangement of conventional weapons such as machine guns, grenades and rocket launchers, cannons, or combinations thereof.

Suitably the set defence means comprises or includes multi-barrel weapons
25 each having barrels loaded with multiple sequentially fired projectiles selectively fired by electronic controls and more preferably of the general type described and or illustrated in the present inventor's earlier International Patent Applications Nos. PCT/AU94/00124, PCT/AU96/00459 and PCT/AU97/00713.

This preferred arrangement provides the advantage of the set defence means
30 being relatively transportable and compact and thus easily concealed while providing the ability to deliver relatively large numbers of projectiles to the detected zone in a very short space of time.

The set defence means can also be of a one-use disposable type enabling size optimization to be more easily achieved and also providing cost benefits. This has benefits over conventional weapons in that each set defence module is free of ammunition feed and ejection systems, breech opening or mechanical operation.

- 5 This enables each defence module to be self-contained in a compact shell or container which may be partially buried readily deployed without much concern.

BRIEF DETAILS OF THE DRAWINGS

In order that this invention may be more readily understood and put into
10 practical effect, reference will now be made to the accompanying drawings which illustrate typical embodiments of the invention wherein:-

FIG. 1 is a diagrammatic layout of a typical installation;

FIG. 2 provides a diagrammatic perspective view of the embodiment illustrated
in Fig. 1;

15 FIG. 3 is a diagrammatic perspective view of an alternate layout;

FIG. 4 is a view which is similar to Fig. 3 but illustrates alternate forms of set defence means;

FIG. 5 illustrates a further embodiment of the invention in which the said defence means and the remote monitoring means are deployed on a vehicle;

20 FIG. 6 illustrates an alternate form of vehicle deployment;

FIG. 7 illustrates an installation in which the said defence means provided with permanent in-ground mountings in the designated area with reloadable inserts;

FIG. 8 illustrates a remote visual display monitor for a manual override control of the said defence means;

25 FIGS. 9, 10 and 11 illustrate yet further embodiments in which the defence means is delivered by an aircraft; and

FIG. 12 is a table listing different weapon types and their relevant criteria.

DESCRIPTION OF EMBODIMENTS OF THE INVENTION

30 Referring initially to Figs. 1 and 2, it will be seen that a designated area 10 to be defended is monitored by an array of field sensors 11 distributed over the designated area and which may be of any suitable type such as pressure, acoustic or seismic type sensors.

The illustrated set defence means 12 employs a weapon in the form of a pair of grenade boxes 13 each of which is substantially identical and coupled to a remote sensing means 14 and to a receiver unit 19 associated with the field sensors 11. The remote sensing means 14, which in this embodiment is tower mounted, is adapted to sweep the designated area 10 using electro-optical or microwave techniques to monitor any intrusion into the designated area by a personnel or vehicles.

The receiver unit 19 is adapted to receive signals from the array of field sensors 11, using a radio frequency (RF) communications link in the embodiment (although a cable link may also be employed), such that upon any such intrusion the zone of the intrusion will be isolated for targeting by grenades fired from the grenade boxes 13. Thus the designated area 10 may be monitored by either or both of the array of field sensors 11 or by the remote sensing means 14.

It will be seen that each grenade box 13 is located in a substantially concealed position in the ground and, of course, once set up the hole in which the grenade box 13 is placed may be back filled without causing any detrimental effects to the operation of the grenade box.

Typically the grenade box 13 has an outer case in which the weapon is delivered to the front and which includes a lower casing portion 15 supporting the barrels 16 and which remains as an integral part of the weapon. An upper removable lid assembly 17, when removed, forms an adjustable base mounting for setting the trajectory and direction of the grenades launched therefrom.

For this purpose screw jacks 18 or the like may be coupled between the base mounting 17 and the lower casing portion 16 to adjustably set the trajectory. A turret type mounting may also be provided to aim the barrels 16. The hole in which the box 13 may be backfilled to substantially bury the grenade box 13 to provide substantial concealment and stabilization of the weapon.

Typically the weapon illustrated contains 588 grenade carrying projectiles contained six to a barrel with the box containing a stack of 98 barrels in rows of side by side barrels. It is considered that such a box for 40 mm grenades would be in the order of 600 mm square in cross-section and 750 mm deep.

A small control circuit (see Fig. 2), provided as a plug-in connection to the grenade box 13, is fitted on-site but not during transport so as to maintain safety of the weapon during transport. Once fitted with the control circuit, the weapon is

armed and ready to fire in accordance with controls provided by the sensor unit 14 and/or the receiver unit 19.

5 A central remote sensor 14 in Fig. 2 is linked to multiple grenade boxes 13 via respective control boxes 13a. In use, if an intrusion into the detected area is detected at a zone, such as any one of the zones indicated as 20 to 29, the selected grenade box 13 can be activated to fire one or more grenades into that particular zone. For this purpose, the barrels of the weapon may have an in-built aiming system providing sufficient variation for selection of any one of the target zones at a respective side of the designated area.

10 Alternatively the grenade boxes 13 may be such that, in the operative range of say 100 m to 1500 m, the grenades launched from the lower left hand tubes or barrels will reach the near left hand corner of the designated area, whilst the grenades launched from upper left hand barrels will reach the far corner of the designated area. Similarly those grenades launched from the corner barrels at the
15 right hand side of the box will reach the near and far portions at the middle of the designated area.

In this manner, selected barrels can be activated to fire grenades to the desired zone. For this purpose, the barrels can be disposed with their axes parallel or splayed to achieve the desired target impact pattern.

20 From the above it will be seen that if desired, all barrels may be simultaneously activated to fire one round so that all of the designated area is shelled with grenades. Alternatively, one grenade may be fired to any zone in which a presence is detected. Then again, that zone or all zones may be subject to any selected number of grenades up to the six contained in each barrel. If desired, all of
25 the grenades may be despatched to each or all of the designated zones in a fraction of a second.

The grenade boxes 13 of the embodiment utilise the inventions disclosed in my previous International Patent Applications which provide simple and effective means of stacking multiple electrically fired projectiles in individual barrels or in
30 groups of barrels, being free of feed or ejection systems or any mechanical operation.

The grenade boxes may be buried just below the ground or their upper end may be open and concealed by suitable camouflaging. Ingress of water or other

contaminants into the backfill or the hole into which the grenade box 13 is located will not affect the operation of the grenade box.

Thus it will be seen that such grenade boxes can be quickly deployed in a war zone and connected to on-site or remote sensors to provide a hands free defended
5 zone which will perform the functions of a minefield without having the disadvantage of remaining permanently after the defence is not required. In this respect, at any time the grenade boxes may be easily removed as a unit when not required.

Correspondingly, they may be easily replaced and if desired, a plurality of grenade boxes may be located in each site such as in a trench with suitable controls
10 to have them fire in series so that after one grenade box 13 is depleted of its grenades, the next is activated.

Furthermore, if desired, the leading rounds of a grenade box may contain sensors which are fired upon installation of the grenade boxes so as to locate the
infield sensors in the actual position to which the grenades will be fired from that
15 barrel. Thus, designated areas may be set with an array of field sensors for subsequent activation of the remaining rounds of the particular or associated grenade boxes.

In the embodiment illustrated in Fig. 3, the grenade boxes are replaced by banks of weapons 30 which are configured as kinetic close range solid state gun
20 systems and which, in the illustrated embodiment, comprise groups of repeatable solid state barrel blocks 31 arranged to fire 9 mm rounds across the designated area. The barrel blocks may be angled to deliver cross fire on targets within the designated area. In one particular arrangement, one bank 30 comprising a group of three (3) barrel blocks together provide 192 barrels loaded with a total of 768 9 mm rounds,
25 capable of a maximum firing rate of 8.4M spm. Each block has approximate dimensions of 100 mm x 100 mm x 150 mm (4" x 4" x 6") and, when loaded, weight only 5.5 kg (12 lb) each.

In the embodiment illustrated in Fig. 4, the weapons 40 fire air burst 25 mm high explosive rounds onto the target zones. The air burst rounds are adapted to
30 explode at a low level above the ground such as at about 1 m to 3 m. The bank 40 of barrel blocks 41 of this embodiment provide 27 barrels loaded with a total of 81 rounds, capable of a maximum firing rate of 100,000 spm. The blocks have

dimensions of 125 mm x 125 mm x 600 mm and , when loaded, weigh 18 kg (40 lb) each.

Of course, the grenade boxes 13 of earlier embodiments may be used in combination with the kinetic rounds, air burst rounds or other special purpose rounds so as to suit the particular situation. Different battlefield situations may have varying terrain and include bodies of water and in such instances, the type of round can be selected to suit the terrain at each particular zone.

Additionally, the weapons can be carried on a vehicle such as a wheeled vehicle 50 in Fig. 5 or a tracked vehicle 60 in Fig. 6. In the wheeled vehicle 50, a grenade box 13 is supported in a turreting platform 53 on the tray of the utility while the roof supports the target acquisition sensors 51 and grenade dispensers 52 fired horizontally from the roof of the vehicle 50.

According to a further embodiment which could be particularly suited to defending an area such as the perimeter of an airfield or the like, such as illustrated in Fig. 7, the designated area contains permanent in-ground launching cases 70, each of which is adapted to receive removable inserts 71 of multiple projectile barrels to suit the particular purpose. For example, the projectiles may contain air burst grenades 75 adapted to explode several metres above the ground for use as anti-personnel defences. Alternatively, the projectiles may be adapted to explode at a higher level for anti-aircraft defence. Preferably the in-ground cases are installed permanently and are armed or disarmed as required by inserting or removing the removable barrel insert.

Suitably each in-ground case 70 includes a power source, such as a battery, a firing sequencer and transmission means, such as communications electronics, for remote control of an inserted barrel. Remote control may be effected from a manned fire control station 72, which receives detection signals from sensors 73 associated with each in-ground case. The signals are relayed to and from the sensors and firing sequencer via a communications link 74. A sensor mast 76 may also be employed for remotely monitoring the area to be defended.

Additionally, in this embodiment, as in the earlier embodiment, manned stations may be provided to override the automatic controls and as illustrated in Fig. 8, the ground control may have a screen 80 for video surveillance cameras which monitor the designated area and suitable control means 81 which enables an

operator to highlight the visible area in the screen where troops or vehicles are intruding for automatic firing of a barrel of a selected weapon 82 which will target those areas.

As illustrated, the screen 80 may include rate of fire, area of fire, density of fire
5 and duration of fire or other controls such as type of round to be despatched to the targeted zone.

Furthermore, the rounds may be delivered from pods supported by aircraft provided with remote control from the minefield sensors such that a manned or unmanned aircraft may deliver the grenades or other grounds to the target zone
10 indicated by the monitoring means.

Figs. 9 and 10 illustrate how a plane and/or a helicopter may be used to support the weapons for discharging a fixed array of rounds onto a target zone. A fixed wing ground attack aircraft 85, such as the Fairchild A-10 "Thunderbolt", when fitted with 4 grenade pods, can deliver 21,168 grenades from 3,528 barrels or tubes
15 at any desired rate up to 10.4M spm. In the illustrated arrangement, there are provided minefield boundary sensors 86, together with a fire control station 87 up-linked to the aircraft 85.

Alternatively, as illustrated in Fig. 11, the grenade box 90 may be of a cylindrical form provided with barrels radiating from a central control core which may
20 be either mounted on the ground or dropped by a parachute, but again with control from the monitoring means so that the rounds may be despatched to the designated target zone.

Each barrel assembly may have multiple grenade carrying projectiles of substantially known form loaded in rifled barrels to impart spin upon firing for
25 activating the arming device. However a rupturable propellant cup is fixed to the projectile for flight therewith.

In use, as per my earlier inventions, loading of the projectiles forms wedge type seals at the leading and trailing ends of a sleeve associated with each projectile while firing releases the leading seal but maintains an operative seal at the rear end
30 of the sleeve. As the pressure projecting the projectile is relative low, in the order of 3000 psi, only minimal sealing is required.

Fig. 12 lists typical weapons which may be used with the present invention indicating range, the number of simultaneous rounds which may be despatched, the

maximum rate of fire, the total number of rounds per weapon, the envisaged overall dimensions and envisaged overall weight.

- 5 It will of course be realised that the above has been given only by way of illustrative example of the invention and that all such modifications and variations thereto as would be apparent to persons skilled in the art are deemed to fall within the broad scope and ambit of the invention as is herein set forth in the following claims.